

Claims:

What is claimed is:

1. A2 A method for producing high-alumina bodies at reduced sintering temperatures, comprising the steps of:

- a) providing an alumina powder precursor;
- b) adding water to the alumina powder precursor;
- c) adding about 1-10 weight percent substantially water soluble magnesia powder precursor to the alumina powder precursor to make an aqueous green powder precursor;
- d) mixing the aqueous green powder precursor;
- e) drying the aqueous green powder precursor to obtain a green powder;
- f) pressing a green body from the green powder;
- g) removing residual moisture and organic material from the green body; and
- h) firing the green body to about cone 13 to produce a high-alumina body.

2. The method of claim 1 wherein the magnesia powder precursor is magnesium carbonate.

3. The method of claim 1 wherein between about 2 weight percent magnesia and about 6 weight percent magnesia are added.

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4. The method of claim 1 further comprising the step of between b) and d), adding a 3 percent aqueous solution of carboxymethylcellulose; wherein the green body is fired in air; wherein about 2 weight percent; and wherein mixing is accomplished by wet ball milling with alumina media.

5. The method of claim 1 wherein the high-alumina body is substantially resistant to dissolution in molten aluminum.

6. The method of claim 1 wherein the high-alumina body is substantially resistant to chemical attack over the pH range from about 0.3 to about 13.5.

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A method for producing high-alumina bodies having enhanced chemical stability at reduced sintering temperatures, comprising the steps of:

- i) providing an alumina precursor;
- j) adding about 1-10 weight percent substantially water soluble cation source to the alumina precursor;
- k) mixing the alumina precursor;
- l) forming the alumina precursor into a desired shape; and
- m) firing the alumina shape to produce a substantially non-vitreous high alumina body;

wherein the cation source supplies a cation to the alumina precursor; and

wherein the cation is selected from the group consisting of magnesium and chromium.

8. The method of claim 7 wherein the high alumina body has a substantially uniform grain size.
9. The method of claim 7 wherein the alumina precursor is a powder and wherein the alumina precursor is formed into a desired shape by pressing.
10. The method of claim 7 wherein the alumina precursor is a slurry and wherein the alumina precursor is formed into a desired shape by casting.

11. The method of claim 7 wherein the alumina precursor is a slurry and wherein the alumina precursor is formed into a desired shape by spraying.

12. The method of claim 7 wherein the substantially non-vitreous high alumina body is part of a metal matrix composite.

13. The method of claim 12 wherein the metal matrix is aluminum.

14. The method of claim 7 wherein the alumina precursor is fired by rapid passage through a sufficiently intense hot zone.

15. The method of claim 14 wherein the alumina precursor is substantially particulate and wherein the alumina precursor is passed through the hot zone under quasi-weightless conditions.

16. The method of claim 7 wherein the high alumina body is substantially resistant to dissolution in molten aluminum.

17. The method of claim 7 wherein the high alumina body is substantially resistant to chemical attack over the pH range from about 0.3 to about 13.5.

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18. A high alumina material formed by the process of:
- aa) providing an alumina precursor;
 - bb) adding about 1-10 weight percent magnesia precursor to the alumina precursor;
 - cc) mixing the alumina precursor;
 - dd) forming the alumina precursor into a desired alumina shape;
- and
- ee) firing the alumina shape to produce a substantially non-vitreous high alumina body;
- wherein the substantially non-vitreous high alumina body is substantially insoluble in molten alumina; and
- wherein the substantially non-vitreous high alumina body is substantially resistant to chemical attack over the pH range from about 0.3 to about 13.5.

- 3bA4 19. ~~The process of claim 18 wherein the alumina shape is fired to about cone 13.~~

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20. The body of claim 18 further comprising the step of between bb) and dd), adding an approximately 3 percent aqueous solution of carboxymethylcellulose; wherein the green body is fired in air; and wherein mixing is accomplished by wet ball milling with alumina media.

21. A weldable metal matrix composite, comprising:
a metal matrix; and
a particulate alumina phase dispersed in the metal matrix;
wherein the particulate alumina phase is substantially non-degraded by molten aluminum.

22. The metal matrix composite of claim 21 wherein the particulate aluminum phase is present in an amount ranging from about 5 weight percent to about 25 weight percent of the metal matrix composite.

23. The metal matrix composite of claim 22 wherein the particulate aluminum phase is present in an amount of about 15 weight percent of the metal matrix composite.

24. The metal matrix composite of claim 21 wherein the metal matrix composite may be welded by conventional welding techniques to form a welded joint.

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25. The metal matrix composite of claim 24 wherein the conventional welding technique is TIG welding.

26. The metal matrix composite of claim 24 wherein the conventional welding technique is MIG welding.

27. The metal matrix composite of claim 20 wherein the welded joint includes alumina particles dispersed therein and wherein the alumina particles are substantially non-degraded.

28. The metal matrix composite of claim 21 wherein the particulate alumina phase is substantially non-vitreous.

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